



Lakes and Ponds



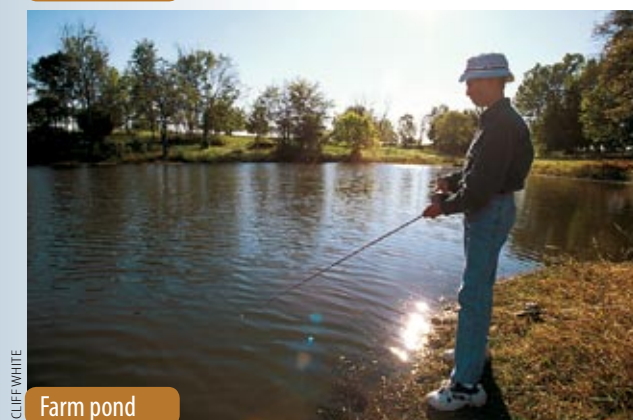
© DANE JOHNSON / VISUALS UNLIMITED

Oxbow lake



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Sinkhole pond



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Farm pond



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Reservoir

FIG. 8.1—Missouri has few natural lakes and ponds—oxbow lakes formed by rivers and sinkhole ponds formed by collapsed caves. More common are farm ponds and reservoirs formed by damming rivers.

Questions to consider

- ① How do oxygen levels in ponds change during each 24-hour period?
- ② What kind of organism makes up the greatest amount of living material in a pond?
- ③ Besides providing food, what other roles do plants have in lake and pond ecosystems?
- ④ How are plants that live under water similar to plants that live on land? How are they different?
- ⑤ How do ponds change over time?
- ⑥ How are lakes similar to ponds? How are they different?
- ⑦ How can lakes and ponds be kept healthy?

Missouri has more than a quarter-million acres of public lakes and half-million acres of ponds. Both lakes and ponds are bodies of standing (not flowing) water, but lakes are larger. Most lakes and ponds in Missouri are artificial. These lakes are formed by damming rivers or streams. Small ponds are formed by trapping water in valleys or other low spots in a watershed. (FIG. 8.1) Some of Missouri's farm ponds were created to make up for water resources and aquatic habitat lost when wetlands were drained to create farmland and rivers were straightened to improve navigation.

A pond is shallow enough that sunshine can reach the bottom, allowing rooted plants to grow completely across it. Its water temperature is fairly even throughout and changes with air temperature. There is little wave action, and the bottom is usually covered with mud. As plants move in, they sink their roots into the pond bottom and hold the soil, making the water even clearer and allowing more plants to grow at greater depths. This is important to the life of a pond because the plants produce much more than food.

Ponds breathe

Out here in the air, oxygen levels are fairly constant, staying around 21 percent all the time. But in a pond the oxygen levels can vary wildly over the course of a day. This is because water takes up oxygen from the air more

slowly than animals in the pond use it. Without plants, the animals would not have enough oxygen. Plants give off oxygen as a byproduct of photosynthesis. As the day goes on, plants release oxygen into the water, raising the overall level of dissolved oxygen in the pond. At night the plants stop photosynthesizing, but the pond's animals continue using oxygen. In this cycle the oxygen made each day is used at night. (FIG. 8.2)

Not all of the oxygen in a pond is made by the plants you can see. Some is made by plant-like plankton. These are tiny, free-floating plants. Most of them are species of algae. They release oxygen into the water and serve as food for tiny, free-floating animals (also called plankton) and larger animals that eat plankton. Underwater plants and plankton make up the food base for the entire pond ecosystem. Plankton makes up about 87 percent of the living stuff in a pond. (FIG. 8.3)

Animal-like plankton eat plant-like plankton and each other. Animal-like plankton can be larger, complex organisms, such as water fleas, or they can be as small as single-cell protozoa. (FIG. 8.4) Animal-like plankton is a major food source for many invertebrates, such as water scorpions and diving beetles, which eat almost nothing else. Plankton has a high protein content and there is a lot of it in lakes and ponds. Because of this, some fish have developed the ability to filter plankton from the water. Fish such as gizzard shad and paddlefish are **filter feeders**. They eat nothing but plankton. In the open water, plankton has no defense except luck against filter feeders. Other small animals are in a similar predicament. They also seek shelter among the plants and parts of plants growing underwater, which offer hiding places from predators.

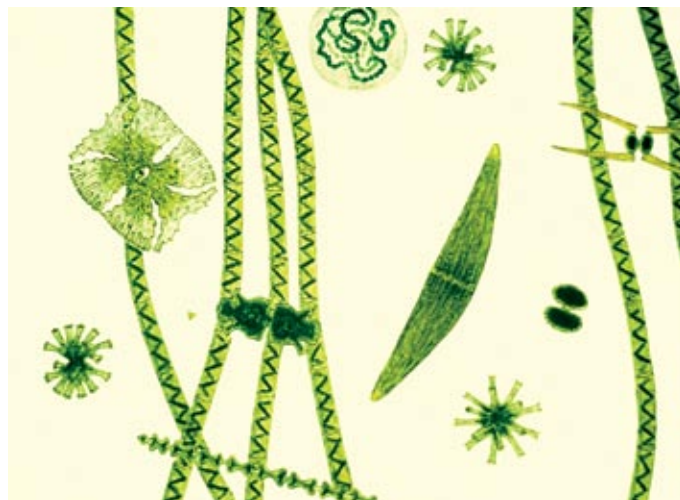


FIG. 8.3—Plant-like plankton are the food base of the pond ecosystem.



FIG. 8.4—Animal-like plankton are primary consumers of plant-like plankton, and are themselves food for secondary consumers such as filter feeders, newly hatched fish and many invertebrates.

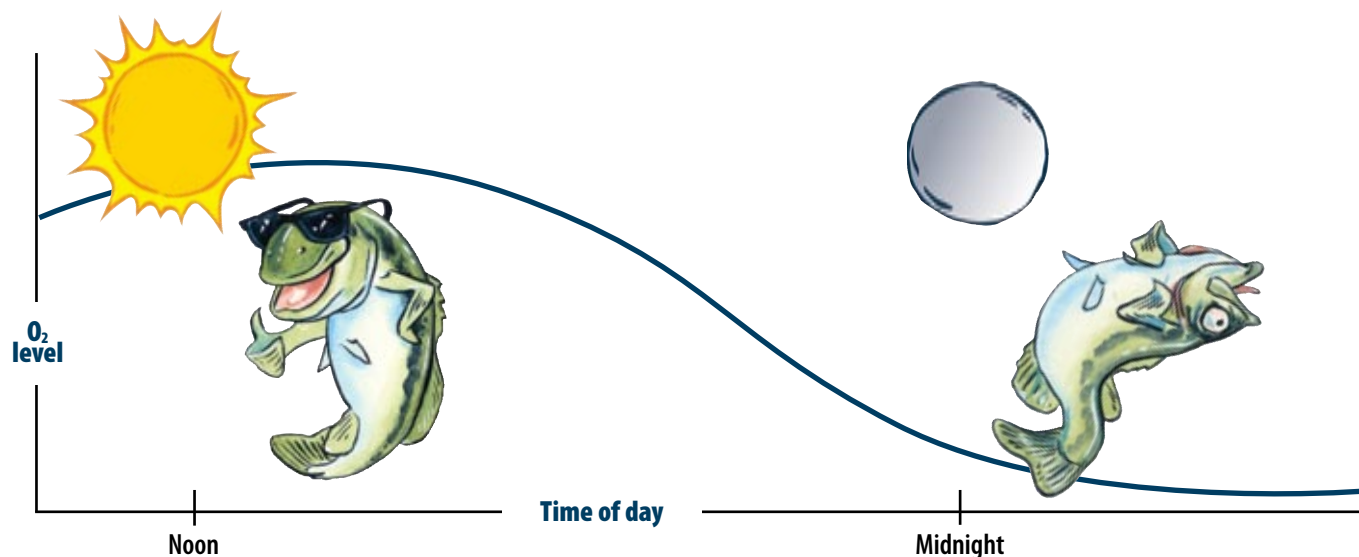


FIG. 8.2—Oxygen levels in a pond are high while the sun is shining and plants are photosynthesizing, but they can drop dramatically at night. If they drop too much, fish and other aquatic animals can die from lack of oxygen.

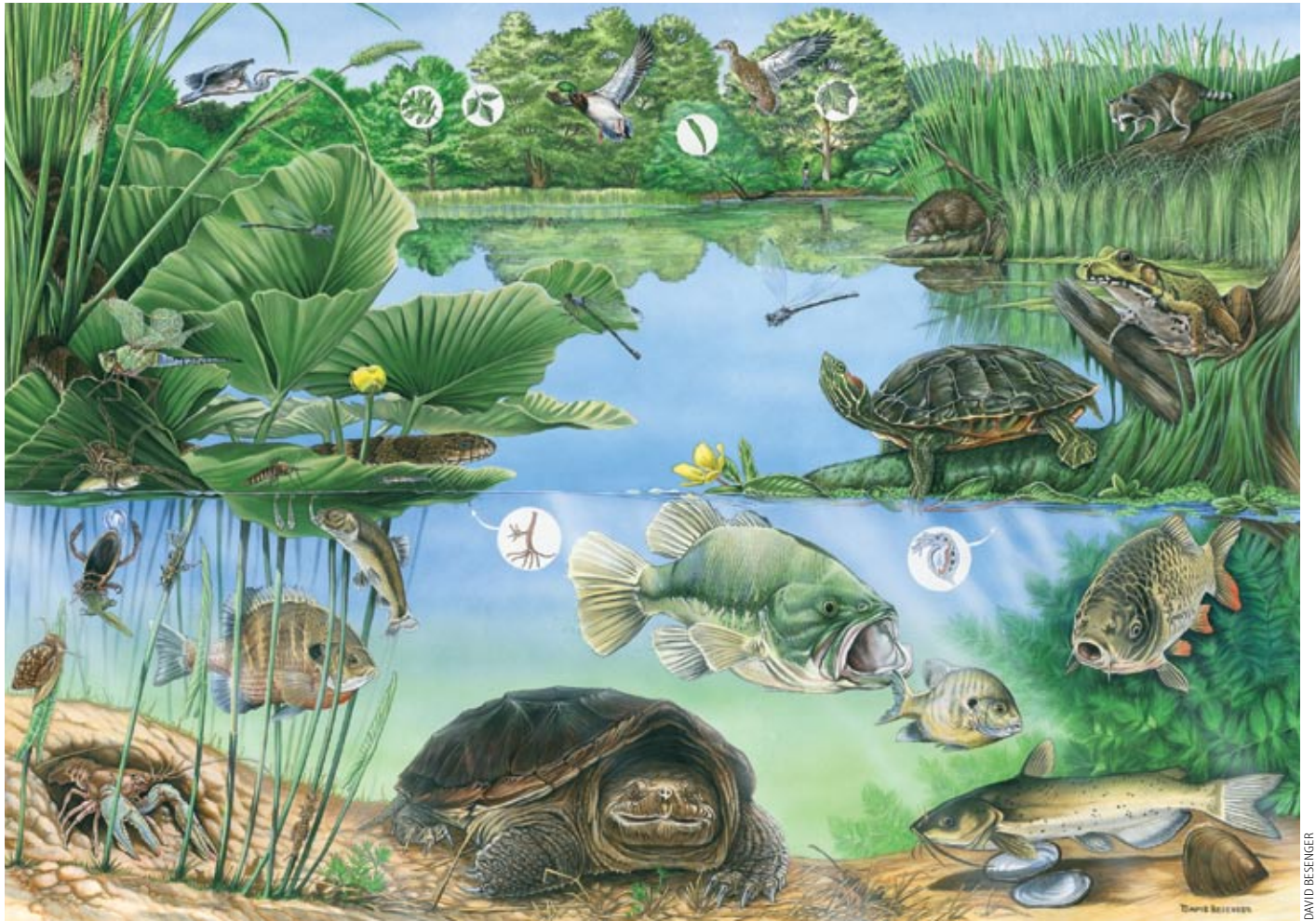


FIG. 8.5—Lakes and ponds are among Missouri's most well-known aquatic ecosystems.

A ring of life

Plants spread out in beds or clumps and attract a variety of animal life. But submerged plants can only grow as deep as the sunlight reaches into the water. Therefore, a lake or pond has most of its plant life in a ring around the shoreline, reaching out as far as it can survive. This ring holds the greatest variety of life to be found in the ecosystem. Mud around a pond often contains tracks of all kinds of animals. Look carefully—maybe a deer or raccoon has been there. (FIG. 8.5)

In North America around 5,000 species of insects spend some or all of their lives in the water. Many of these insects make plants their homes. The plant beds serve both as shelter from predators and as a food source for the insects. Insect-eating animals seek out the large number of insects in this area, too. They visit the plant beds to feed, forming a complex food web of predators and prey.

Some plants live entirely underwater, while others have some of their parts sticking out of the water. Plants that live underwater are like plants that live above water. They need water, carbon dioxide, sunlight and

nutrients such as phosphorous and nitrogen. But water plants have special adaptations that help them thrive in their underwater environment. Waxy or slimy coatings protect them from drying out when water levels drop. Porous stems or leaves let them absorb minerals right from the water.

Ponds don't last forever

As water runs downhill through the pond's watershed, it picks up small bits of soil and anything else that can be moved. This erosion brings sediment to the pond, replacing water with soil and creating more shallow areas. Decaying plants and animals fall to the pond bottom, adding to and enriching the sediment. Plants thrive in the rich sediment and take up more space. In time the pond will become a wetland, then as it fills even more, a meadow. This natural process is called **pond succession**. (FIG. 8.6)

The surface water that fills a pond also can bring trouble in the form of pollution. Excess soil and plant nutrients can overload the pond and unbalance its growth cycle. A common result of this imbalance is too

Pond succession (FIG. 8.6)



much algae growth. Algae overgrowth makes the water cloudy and shades out rooted plants. When the excess algae dies, it creates a lot of decomposing material that uses up oxygen and causing the fish to die from lack of oxygen. This can speed up pond succession. (FIG. 8.7)

Because every water body is a reflection of its watershed, good watershed management is important to keeping a pond healthy. Stopping excess erosion and runoff loaded with fertilizers, pesticides or other pollutants is key. Keeping a 100-foot-wide buffer of thick plant growth around the pond helps filter out pollutants and eroded earth before they reach the pond.



FIG. 8.7—Bubbling mats of free-floating or hair-like algae and dead fish indicate that excess nutrients have caused overgrowth of algae, resulting in oxygen depletion in this pond.

A plant buffer will greatly improve the pond's health and extend its life. The same is true for lakes.

Lakes are bigger than ponds

While lakes and ponds have much in common, a lake's larger size makes for some differences. These include oxygen levels, plant growth and temperature. In a lake, the amount of oxygen dissolved in the water stays pretty even over a 24-hour period. While a strong wind can ruffle up a pond's surface, on a lake, it can whip up high waves. This mixes oxygen into the water.

In at least some places, the water in a lake is too deep for plants to grow on the bottom. Only in the area around the shore is the water shallow enough for sunlight to reach plants growing on the bottom. The ecology of the shoreline zone is like pond ecology. (FIG. 8.8)

A lake also has an open-water zone away from shore, as far down as sunlight reaches. Most large fish spend most of their time in this zone, swimming into the shoreline zone now and then to feed or spawn. In the deep-water zone, below the open-water zone, not enough light reaches the bottom for plants to grow. This makes the deep-water zone oxygen poor, and not much lives there. Dead organic matter sinks to the lake bottom, where bacteria and other decomposers break it down.

The temperature in a lake is fairly even from day to day in a given season. However, in summer, lake water is much warmer on top in the shoreline zone and the open-water zone than in the deep-water zone. In the fall, temperature changes cause the layers to mix, bringing decaying organic matter from the bottom up to the surface. We may not like the smell, but this is a natural process that mixes nutrients, minerals and oxygen throughout the lake.

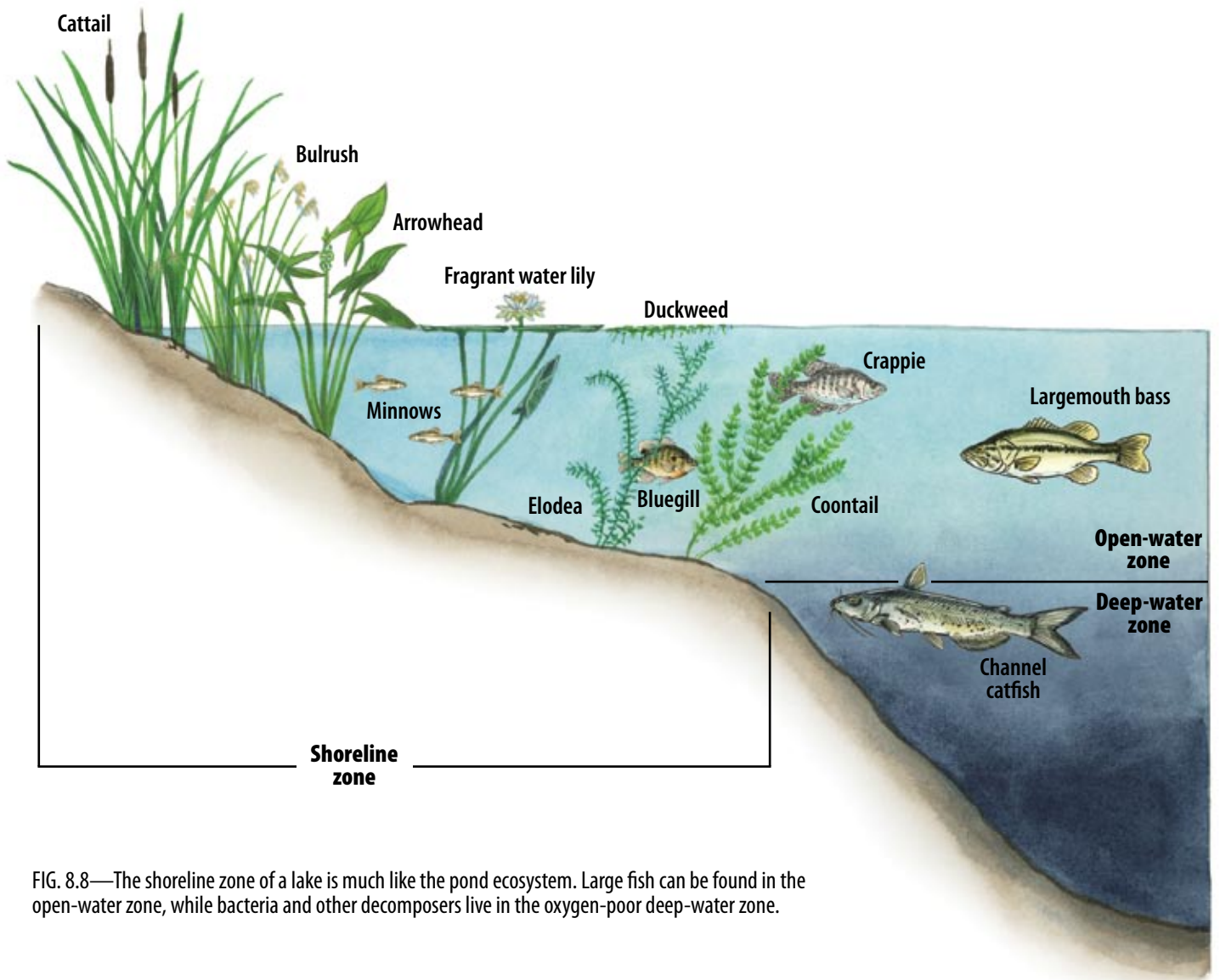


FIG. 8.8—The shoreline zone of a lake is much like the pond ecosystem. Large fish can be found in the open-water zone, while bacteria and other decomposers live in the oxygen-poor deep-water zone.

Lake and pond management

Lake managers provide the good watershed management needed to maintain a healthy lake or pond. Like fisheries biologists, they often manage resources to make the most of the lake as a place to fish. Many have degrees in fisheries management. Besides working for agencies such as the Missouri Department of Conservation, lake managers sometimes go into business for themselves, working as independent advisors and managing a number of lakes for several customers.



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